Choosing an Amptek Spectrometer

Step 1 - Choosing the detector

The detector "element" determines a lot of the performance characteristics such as energy resolution, efficiency, count rate, etc. Below is a recommended path for choosing the right detector for you, but if you need help choosing, **please contact Amptek's Applications Engineer for assistance.**

First, choose a detector family

FASTSDD – Overall best performance, wide energy range (100eV to over 40keV).
SDD (Obsolete) – Balanced performance vs cost.
SiPIN – Lowest Cost
CdTe – Higher energy efficiency, up to 100keV easily, x-ray tube characterization.

Define the Low Energy limit required or desired.

Minimum is <1kev - FastSDD only, the different window options really define that low energy limit

C1 Window – Down to Carbon, or about 300eV.
C5 Window – Down to Carbon, or about 200eV.
C2 Window – energies down to 100eV, must be dark, must not have helium.
Windowless – Not recommended but reaches the lowest possible energies detectable. Must be dark, must always operate in vacuum, must never be exposed to contamination.

Minimum is 1keV -3 keV–FastSDD or SiPIN

0.5mil Be (~12um) – standard window option
B4C – Boron Carbon, beryllium free alternative

Minimum is Above 3 keV–FastSDD, SiPIN, CdTe

0.5mil Be (~12um) – standard window option – still works
1.0mil Be (~25um) – durable window option (SiPIN or CdTe only)
Thinned nickel, for applications that don't need data below 5keV (usually CdTe)

Define the count rate - Larger area detector chips increase flux or count rate, the high energy limit is defined by the chip material and thickness, we have options for 0.5mm, 0.75mm (CdTe only), or 1mm.

FastSDD are vailable in 25mm2 and 70mm2 detector chip areas. More counts can be collected on larger area detectors, but counts can't exceed detector maximum count rate. FastSDD are available with 0.5mm thick Silicon as standard, and 1mm thick for better efficiency of higher-Z elements.

SiPIN are available in 6mm2 and 25mm2 detector chip areas. Resolution is best on smaller areas, but count rate can be higher on larger area detectors. Chosen when cost is the more important.

CdTe detectors are available with 0.75mm or 1.0mm thick chips. Gets the most counts in applications reaching above 30-40keV, up to 150keV recommended.

Then choose other options, cover shape, collimator, etc.

Beveled Cover, square Cover, internal collimator, multilayer or otherwise, windows can be brazed for use with helium. If you are curious, as the applications engineer for details.

**Amptek commonly has about 30 detector options available. Some combinations may not exist.

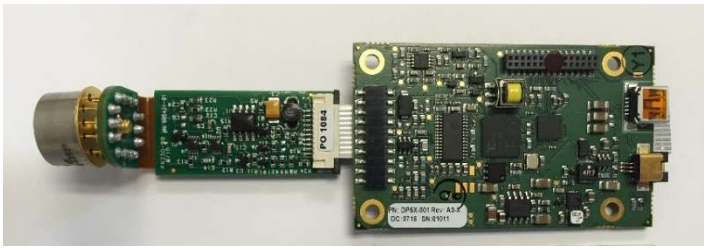
Step 2 – Choosing the Preamp and DPP Size and Shape options

The preamp and DPP options determine system size, mechanical configuration, electrical & software interfaces; spectroscopic performance is (nearly) independent of preamp/DPP. The major choices are (a) board level vs integrated, (b) smallest size vs special functions and extra options, and then (c) details such as type of housing, length of extender. There are a variety of semi-custom systems for very special functions, e.g. vacuum options.

X55 is a compact, low-cost, modern design, is the smallest complete integrated box design for SiPIN and FastSDD's, and is recommended for most applications.

PA230 with **DPX** board is a similar option when the integrated housing isn't desired, particularly good for handhelds and tight-geometry.

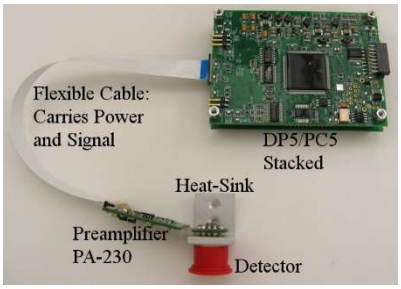




X123 integrated or **X123 Option 6** are a very common choice. The X123 has been the gold standard for work with all our detectors since 2008. Has more 'bells and whistles', aux I/O, Ethernet, Rs232, various extender options, vacuum options, etc.

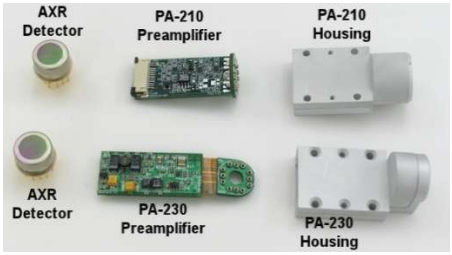






The **XR100** is a good solution where size is less important. But the power interface is non-standard so customers have to make their own power supplies.





XR100 & PX5 is used in lab settings; it has the most auxiliary I/O, convenient BNC outputs, etc.

DPX-Nano and **DPX-SM** are for specialty OEM uses (smallest size, streaming mode)

For **Vacuum Applications**: I recommend either X123 with long extender through an o-ring flange (Vac option B1), the X123 with a flex cable to vacuum flange and the flange to a PA230 (Vac option A2). Ultra-high vac option only if required. See our Vacuum options for details. https://www.amptek.com/products/x-ray-detectors/vacuum-applications-for-amptek-detectors

For all technical questions, please contact Amptek Applications Engineer:

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